MULTIMEDIA UNIVERSITY

STUDENT IDENTIFICATION NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2018/2019

DBM5014 – BUSINESS MATHEMATICS

(RS)

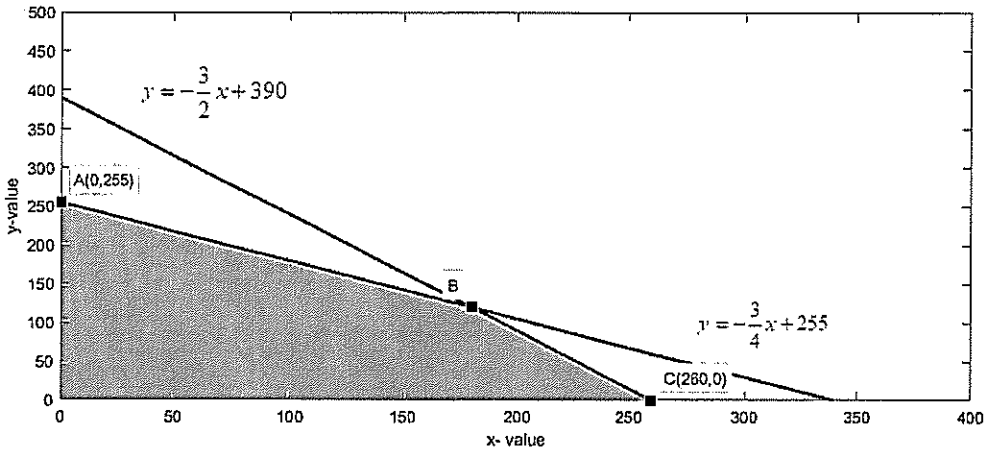
30 MAY 2019
9.00 a.m – 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of **4** pages excluding cover page and appendix.
2. Attempt **ALL FOUR (4)** questions. The marks distribution for each question is given.
3. Write your answers in the answer booklet provided.
4. Key formulae are given in the Appendix.

QUESTION 1

a) Faculty of Business from Multimedia University (MMU) will be organizing a *Global Business Case* competition which require the participation from MMU students, x and non MMU students, y. The fees incurred for each MMU student is RM200, and for each non MMU student is RM250, respectively. The following graph represents the terms and conditions according to student's participation.



i. Determine the objective function. (1 mark)
ii. State the linear inequalities obtained from the graph. (3 marks)
iii. From the graph, find the coordinate of point B. (5 marks)
iv. Evaluate each of the corner points and obtain the maximum fees. Hence, determine the number of participants for MMU and non MMU students. (6 marks)

b) Mr. Ammar eats a mix of Cereal A and Cereal B for breakfast. The amount of calories, sodium and protein per ounce for each is shown in the table below.

	Cereal A	Cereal B
Calories	80	120
Sodium (mg)	100	80
Protein (g)	6	8

Mr. Ammar's breakfast should provide at least 600 calories but less than or equal to 800 milligrams of sodium and at most 960 grams of protein. By letting x denote the number of ounces of Cereal A and y denote the number of ounces of Cereal B,

Continued...

i. list down the linear inequalities which satisfy the above conditions. (4 marks)
ii. from answer in part (i), obtain the x and y intercepts for each condition. (6 marks)

(Total: 25 marks)

QUESTION 2

a) Director of NS Company want to make an investment to develop their company. He approaches few agents to get some advice for the best plan. Below are the offers that he received.

Agents	Offers
A	Investment amount is RM 250 000 and will receive a compound interest of 7% compounded quarterly for 6 years.
B	Investment amount is RM 300 000 and will receive a compound interest of 5.5% compounded monthly for 5 years.
C	Investment amount is RM 200 000 and will receive a compound interest of 6.5% compounded annually for 7 years.

i. On behalf of the director, calculate the future value that will be received from **each** offer. (12 marks)
ii. From part (i), calculate the interest for **each** offer. (6 marks)

b) Mr. Hambali purchases a new car for the price of RM98 400. He pays 20% down payment and takes loan on the remaining amount for 7 years. Calculate his monthly instalment if the interest rate is 2.4% compounded monthly. (7 marks)

(Total: 25 marks)

QUESTION 3

a) Differentiate the following functions.

i. $y = 4e^x - 2\pi \ln x$. (2 marks)
ii. $y = (4 - 2x^6)(x + 6)$ by using **Product Rule**. (5 marks)
iii. $y = \dfrac{4x^3 - 2}{\pi - 2x}$ by using **Quotient Rule**. (5 marks)
iv. $y = 4(2 - 3x)^6$ by using **Chain Rule**. (5 marks)

Continued...

b) Find $\frac{dy}{dx}$ and $\frac{d^2y}{dx^2}$ for the function $y = \frac{1}{3}x^4 + 2e^x + \sqrt[3]{x} - \ln 2$. (4 marks)

c) Given that the production cost function of cosmetic product is $C(q) = 1991 + 91q + 1.9q^2$ where q is the quantity unit produced.

i. Find the marginal cost function, $C'(q)$. (2 marks)

ii. Evaluate the marginal cost when $q = 2500$. (2 marks)

(Total: 25 marks)

QUESTION 4

a) Find the value for each of the following integrals

i. $\int\left(\frac{2}{x^3} + 4e^x + \frac{2}{x}\right)dx$ (3 marks)

ii. $\int_2^4 (4x^2 + 2)dx$ (3 marks)

b) Given $\int_2^{10} f(x)dx = 11$ and $\int_2^{10} g(x)dx = 2$, find the

i. value of $\int_2^{10}\left(f(x) + \pi\right)dx$ (4 marks)

ii. value of n if $\int_2^{10}\left[2f(x) + ng(x)\right]dx = 44$ (3 marks)

c) Given that $\int 1010x^4(202x^5 + 101)^{11}dx$.

i. If $u = 202x^5 + 101$, find $\frac{du}{dx}$. (1 mark)

ii. From part (i), determine the value of m and n if $\int 1010x^4(202x^5 + 101)^{11}dx = n(202x^5 + 101)^m + c$. (6 marks)

Continued...

d) A Faber Castle manufacturer's marginal cost function is $\frac{dC}{dq} = (q+2)(q+4)$, where q is the number of units.

i. Determine the cost function, $C(q)$. (3 marks)

ii. Find the cost from 10 to 20 units. (2 marks)

(Total: 25 marks)

End of Paper

APPENDIX – FORMULAE

Inequality	Solution
$\|x\| < a$	$-a < x < a$
$\|x\| \le a$	$-a \le x \le a$
$\|x\| > a$	$x < -a$ or $x > a$
$\|x\| \ge a$	$x \le -a$ or $x \ge a$

Effective Rate

$$r_e = \left(1 + \frac{r}{n}\right)^n - 1$$

Simple Interest	Future Value
$I = Prn$	$FV = PV(1+r)^n$
Present Value Annuity	**Future Value Annuity**
$A = R\left[\frac{1-(1+r)^{-n}}{r}\right]$	$S = R\left[\frac{(1+r)^n - 1}{r}\right]$

Derivatives

1. $\frac{d}{dx}(ax^n) = anx^{n-1}$	2. $\frac{d}{dx}[g(x)]^n = n[g(x)]^{n-1} \cdot g'(x)$
3. $\frac{d}{dx}[f(x)g(x)] = f(x)g'(x) + g(x)f'(x)$	4. $\frac{d}{dx}\left[\frac{f(x)}{g(x)}\right] = \frac{g(x)f'(x) - f(x)g'(x)}{[g(x)]^2}$

Logarithmic Functions	Exponential Functions	Chain Rule
$\frac{d}{dx}(\ln x) = \frac{1}{x}$	$\frac{d}{dx}(e^x) = e^x$	$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$
$\frac{d}{dx}\ln u = \frac{1}{u} \cdot \frac{du}{dx}$	$\frac{d}{dx}e^u = e^u \frac{du}{dx}$	

Integration

1. $\int k\,dx = kx + C$	2. $\int x^n dx = \frac{x^{n+1}}{n+1} + C, \quad n \ne -1$
3. $\int e^x dx = e^x + C$	4. $\int \frac{1}{x} dx = \ln x + C$
Definite Integral, $A = \int_a^b f(x)\,dx = F(b) - F(a)$	